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ABSTRACT

This paper argues that multimedia technology can be used by ordinary individuals casually and frequently for very commonplace purposes, which will result in multimedia technology joining the basic repertoire of techniques for individual self expression, along with speech, gesture, and writing. This argument is examined from three perspectives: (1) multimedia technology for personal use is at hand, e.g., on the shelf, or even in the near horizon, are tools that make the materials and techniques of cinema available to any individual; (2) we may be disinclined to imagine the personal uses of multimedia technology because of the overwhelming presence of electronic media as broadcast media in our culture; and (3) personal multimedia technologies will provide individuals with entirely new means of reflection, investigation, and self-expression. (5 references) (EW)

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Multimedia Technology Is for Casual, Everyday Use

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This paper proposes that multimedia technology can be used by ordinary individuals casually and frequently for very commonplace purposes. The implication is that multimedia technology will join the basic repertoire of techniques for individual self-expression, along with speech, gesture, and writing. This proposal is examined from three perspectives:

One: Multimedia technology for personal use is at hand. On the shelf, or on the near horizon, are tools that make the materials and techniques of cinema available to any individual.

Two: We may be disinclined to imagine the personal uses of multimedia technology because of the overwhelming presence of electronic media as broadcast media in our culture.

Three: Personal multimedia technologies will provide individuals with entirely new means of reflection, investigation, and self-expression.

One: Multimedia technology for personal use is at hand. On the shelf, or on the near horizon, are tools that make the materials and techniques of cinema available to any individual.

Video recording

Thirty years ago, the first videotape recorders were available (from Ampex) for broadcast use. They used two-inch tape (about a mile of it to record an hour's worth of video), cost several hundred thousand dollars, and were about the size of a catering truck. Today, over 30 million homes in this country have videocassette recorders (VCRs) that outperform those first recorders in every respect, and cost only a few hundred dollars.

Home VCRs are used primarily for watching rented movies and for "time-shifting"—recording television shows for later viewing. The 30-million-owner mark is a significant one for video producers, because it represents a base market large enough to justify made-for-home video production.¹ And it's a base large and varied enough that video publishers can consider projects for smaller, specialized audiences, in the same way that book and magazine publishers do.

Manufacturers are also providing consumers with more opportunities to use video as well as watch it. Compact video cameras with built-in recording decks have been available for several years. Now Sony has introduced an 8mm video system that includes a "Handycam," a camera and recorder about the size of a cigar box. The Sony system also includes something new for the home market: a video editor that allows people to electronically assemble their home movies. The system is advertised as a way to take "moving snapshots," suggesting simple operation and frequent, casual use.

Optical videodiscs

Optical videodiscs, introduced to the home market in the late 1970s, provide two significant advantages over magnetic videotape. First, laser-read discs are a mass-produceable, virtually indestructible *archival* medium for cinematic materials. Second, the videodisc is a *random access* medium: the laser read head can quickly jump to any spot in the program, while videotape must be laboriously wound and unwound to access a particular spot on the tape. These two qualities make optical videodiscs particularly useful for publishing cinematic reference materials.

Videodiscs also provide unique ways for people to access and use cinematic materials. Random access, coupled with stable still frame and variable-speed play, allows people to probe and peruse a videodisc as they might a book. As Nicholas Negroponte observed in the first days of the technology, the distinction between books and movies "will become thin as soon as we envisage 'books' whose photographs are movies and whose diagrams are animated, or as we embed more and more still-frame material into 'movies.'"

Videodiscs were developed as a redistribution medium for theatrical movies, but the VCR, because it can also record video, has overwhelmingly outsold videodisc players in the home market. Still, some distributors offer videodiscs that introduce viewers to the possibilities of the medium. For example, Voyager Press of Los Angeles distributes a "coffee table" videodisc depicting the city of Vancouver through historical photos, posters, maps, and time-lapse journeys through the streets. Knowledge Set of Monterey, California, produced a videodisc containing—on printed video frames—the entire text (and, ironically, none of the illustrations) of Grolier's *Academic American Encyclopedia*.

Another provocative videodisc offering is the *Video Encyclopedia of the 20th Century* from CEL Communications of New York. It contains 75 hours of indexed primary cinematic source material beginning with footage shot by Thomas Edison at the 1893 Columbian Exposition and proceeding through coverage of disasters, wars, presidents, riots, moonwalks, and other events on up to the present. To have this kind of material for personal use, available as readily as a dictionary or almanac on the shelf, is a very new and exciting possibility. It gives children the opportunity to explore and vividly experience the events that shaped the world as it is today. What might be the outcome of giving a student such video source material, a VCR, and the assignment to put together stories for Eyewitness News?

Compact discs

Over the past three years, consumers have embraced a new technology for recorded music: the digital compact audio disc. Unlike the videodisc, which represents its images and sound in a continuous, or analog form, the compact disc (CD) stores its information in discrete, digital bits.

Both videodiscs and CDs can store images, sound, and text. The digital format of CDs is more economical for text, computer programs, and data bases; the same Grolier encyclopedia that, as printed video frames, occupies an entire videodisc side takes up only one-fifth of a digital compact disc. On the other hand, a videodisc can store more images (54,000) in its analog format than can a compact disc (500–4000); more significantly, the videodisc can store and play moving images. Add to this the fact that videodiscs can also store high-density digital information in several formats, including CD format, and it's clear that the videodisc is the more potent technology.

However, the public's reception of videodiscs has been lukewarm, largely because the marketing focus for videodiscs as a movie redistribution medium has been overshadowed by videotape. It appears that the compact disc is in a better position to become the first interactive multimedia device to be established in the home, in part due to a better-organized industry push for software standards. The compact disc-interactive (CD-I) format supported by Philips, Sony, and others gives developers a standard format for images, sound, and data—something that interactive videodisc producers have never really had.

Although the compact disc cannot reproduce live motion to any useful degree, it has some important elements of a cinema machine. Its vast capacity for storing data can be used to offset the modest microcomputing capability of a home machine. For instance, it can store all of the pre-rendered cells of an animation that a more powerful but less capacious machine might have to draw anew each frame. Also, limited "camera movements," such as a slow pan across a landscape, are possible through well-known digital image-buffering techniques. And, of course, there is abundant high-quality audio to provide a temporal dynamic with music, sound effects, and voice-over narration.

This is not the stuff MTV is made of (yet). But consider a public-television-style historical documentary or science program that is made up entirely of still photos and paintings, animated diagrams, the voice-over narration of the field experts and host, and perhaps an opening pan across a mood-setting landscape with a bird or two flying overhead. A properly designed and outfitted CD-based system could conceivably generate such a program. Moreover, the program could be interactive, paced and structured by the viewer, with megabytes of supplementary information available instantly.

Digital video effects

Videotape and optical discs are multimedia technologies that have made the journey from research laboratory to industry to the home in a generation's time. If we can also apply that progression to technologies being developed today, then within the next decade we should expect to have digital video manipulation capabilities in the home. This would exponentially enhance the features of current technologies, and serve as a catalyst for new technologies, such as electronic photography.

Digital video effects—images that flip and tumble through space, or curl off-screen like the pages of a magazine—are now commonplace on television. These video tricks are accomplished by turning analog video images into digital data, applying geometric transforms on the digital images, and then turning the digital data back into analog video, at rates of 30 frames per second, with one million bytes per frame. The image transformations require that a substantial amount of arithmetic be performed on each and every point of every frame, and be performed extraordinarily quickly. The high-performance devices available today to work this magic (for example, Ampex's ADO and Quantel's Mirage) cost from \$100,000 to over \$500,000. But the core technologies of digital video—huge, fast digital memories and fast, special-purpose microprocessors—continue to get bigger, faster, and less expensive.

Early results are available today. ITT, for example, manufactures a television that can display video from two sources at once: a normal full-sized picture from one source, and a quarter-sized picture from the other source, inset in the larger picture. The underlying digital video capabilities are few but significant: the ability to instantly crop, scale, and position live images anywhere on the television screen, and to overlay them.

Even these simple capabilities change how people can use videotape and videodiscs. With a digital video display, a viewer could simultaneously examine material from the beginning, middle, and end of a video source. This would allow, for example, having several "volumes" of the CEL video encyclopedia open and spread out at once, just as one might with a print encyclopedia. Digital image techniques will also enable people to "cut and paste" video material from different parts of a source, and from different sources, to create entirely new material. This would constitute a personal creative medium that is more expressive and more flexible than anything previously available to individuals.

Two: We may be disinclined to imagine the personal uses of multimedia technology because of the overwhelming presence of electronic media as broadcast media in our culture.

Simple access to new technologies cannot by itself guarantee us a brighter future. We have to know what they can do and how we might use them in order to tap their liberating potential. We can either project a new context for the new technologies, or misuse them in old contexts. That is the present situation for electronic media, which have evolved in an industrial, mass-consumer context, and have so exaggerated the attenuated role of the individual that we may neglect to dream about how these technologies might serve us as individuals.

The role of broadcast media in our culture is a novel one. There has never been anything like it in the past, nothing as compellingly real and immediate, and certainly nothing as omnipresent (except perhaps the church in past ages). For example, in the United States over 98 percent of all households have at least one television set; the average "on" time is over seven hours per day.³ This is an unprecedented, almost unfathomable, sphere of influence—and one that, aside from the token presence of noncommercial public television,⁴ is entirely in the service of commerce.

In order to sell products, the broadcast image is made to appeal to the largest number of people possible. Regional traits are homogenized out of television's oratorical standard: local newscasters around the country, for example, are essentially interchangeable. In its worst (and all too common) moments, commercial television projects its own needs for a buying public on its audience. Through its programs, and particularly through its advertisements, television celebrates the role of the individual as consumer. In the mythology of commercial broadcasting, an individual achieves success and satisfaction not through wit or hard work, but by buying the right products.

This kind of use of television is not inherently unhealthy. In fact, it's probably an inescapable aspect of a free society. What's culturally debilitating is to concede exclusive use of this powerful communications medium to special interests. It would be tragic if we could not at least *imagine* a society where everyone has a voice in this new electronic marketplace of ideas, or if we did not consider what we might become if we were to live in such a culture.

Downscaling technology gives us the opportunity to rethink the use of electronic media, to turn them into something Ivan Illich calls *convivial tools*. "Convivial tools are those which give each person who uses them the greatest opportunity to enrich the environment with the fruits of his or her vision. Industrial tools deny this possibility to those who use them and they allow their designers to determine the meaning and expectations of others."⁵

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From this perspective, broadcast media are industrial tools, for they offer viewers no opportunity to interact with their information environment, nor to enrich it with their personal views. The meaning of the individual in the electronic media environment today is as a demographic unit in the numbers games played by networks and advertisers. On the other hand, in the democratization of electronic media technology there's at least the potential for individuals to define their own role in the society.

With tools for appropriating information in various rich forms (images, sound, computer data) from various sources (on-demand data bases, correspondence from friends, trusted free-lance information hunters, broadcasts), an individual can be an active participant in information gathering. With tools for manipulating multimedia information, for arranging it and reconstructing it like the pieces of a puzzle until a clear picture emerges, an individual can be a powerful analyst, and can concretely recreate the many different points of view from which events and ideas might be understood. With tools for recording and redistributing multimedia information, an individual can achieve a voice in the electronic marketplace of ideas, and help sustain the flow of information that keeps a convivial society alive and spiritually prosperous.

Three: *Personal multimedia technologies will provide individuals with entirely new means of reflection, investigation, and self-expression.*

The impact of personal multimedia technologies on the individual is difficult to predict because there aren't any precedents for the casual, everyday use of such powerful technologies. My intuition is that we are near the beginning of an intellectual revolution as sweeping as the one that accompanied the advent of the printed book. For the first time, ordinary individuals will be able to create and arrange events in space and time, and design direct experiences for themselves and for others. What has been the expressive medium for a very few can now join speech, gesture, and writing in everyone's repertoire of personal expressive forms.

Rather than speculate haphazardly on the nature of these changes, I will close this paper with three scenarios that suggest some possible personal uses of multimedia technology. The settings for these scenarios are purposefully mundane, to emphasize the casual, everyday use of the media. None of the systems described exist today; however, they could be built, if not yet for the home, as laboratory prototypes that anticipate home use.

Database search keys from life

Well, Hillary had certainly caught one this time. It was a large bug, over an inch long, with yellow and orange stripes around its body, and two pairs of wings. Unfortunately for it, one of its wings was broken, which is how Hillary had caught up with it on the windowsill.

"What is it, Mom?"

"I don't know, dear, but please don't wave it in my face. You should go look it up in the encyclopedia."

"OK," said Hillary, and she ran to the family room and inserted the encyclopedia disc into the reader. Holding her prize tightly in one hand, she zipped through the index until she came to the "I" section, and then slowly homed in, first on "insects," and then on the "insect identification" section. She had been there many times before to use the "build-an-insect" classification table.

Hillary selected parts from the table that matched her new prey, and as she did so, the encyclopedia assembled, onscreen, a reasonable likeness of the creature in her hand. "This is a member of the sawfly family," the encyclopedia narrator said, just as the assembled illustration of the creature began to crawl around on a green leafy background. "A primitive relative of the ant, bee, and wasp. Some species are considered pests because their larvae bore into the trunks of weakened or dead deciduous trees."

"Oh-oh, better tell Dad about that," Hillary thought, and paused long enough to print out a picture of the sawfly and its caterpillar-like larva, and a paragraph about its feeding habits. Her father had been wondering lately about the elm in the backyard.

The next page of the article showed a close-up animation of the female sawfly cutting into a maple leaf and depositing her eggs. The printed text explained that the saw-like egg duct of the sawfly had developed into the stinger of wasps and bees. Hillary decided that her next science report for school was going to be about the strange things insect mothers have to do to find a place to lay eggs, so she copied the animated page into her electronic notebook, and typed a note on it to remind herself of some other species to look up later.

A little dialectical montage between friends

Brian was feeling a little outclassed by his Japanese video pen pal, Ichiro, who had sent him a fastidiously assembled videotape of his mother preparing the evening meal. Brian was scanning through his own video that he had taken this evening to send to Ichiro, and he felt a little embarrassed at how crude and ordinary everything seemed. Where Ichiro's mom had artfully sculpted carrots into maple leaves to float in the soup, Brian's mom had used the Cuisinart to shred things for the slaw. Where Ichiro's mom had laid out everything in separate dishes, arranged in a quiet, formal way (which Ichiro displayed proudly with an overhead pan, a "sky-cam" kind of shot), Brian's mom had pretty much just piled the roast and potatoes on a big platter. (Brian scanned in a more picturesque version of the meal from a cookbook and spliced it into his tape; he typed over it in big yellow letters: "This is what it was SUPPOSED to look like.")

All at once he had the insight that would let him trump his Japanese friend. He would assemble the two tapes together to show both the differences and the similarities of the two cultures: their delicate vegetable carving versus his Cuisinart; their steaming oshibori versus the paper towels he used for napkins; their pickled eggplant and burdock root versus (or almost just like!) the pickles and olives on his table. Brian cruised through his videotape with the joystick, hitting the "fire" button to mark the beginning and end of each shot. For every shot he marked, a small icon appeared on the computer screen. Then he began stringing some of the icons together, like beads, into a sequence, alternating shots from his tape with shots from Ichiro's. As he watched the editor assemble his video pen-pal letter, Brian grew more enthusiastic about his new technique. He was a little disappointed that the result wasn't quite as smooth as he wanted, like the things he saw on television. But still, it told his story, and he knew Ichiro would be impressed, and would probably come back with something new himself.

Post-vacation photography as reverie

The snapshots from the trip to Barcelona were back from the photo lab, but to Zeke, they seemed sadly empty of the experience he and Nancy had there. The scale was wrong: the spires of Gaudi's Sagrada Familia cathedral had seemed so imposing, even as they stood at the entrance, unable to see the entire façade. Zeke loaded the PhotoQuick European Travel disc into the mnemotography machine, and quickly scanned to Spain, and then to the Barcelona section. There he found pictures of all of the buildings of Gaudi, with their ornate, organic forms that they had visited in Barcelona. The cathedral, like all the others, was present in two forms: in postcard-photo style and in a series of photographic projections showing all faces, interiors, and landscaping simultaneously—like a cut-out, pop-up dollhouse ready to be assembled.

Zeke selected a view of the exterior of the nativity façade, where they had stood and smiled while the friendly old man took that blurred photo of them. He grabbed the view into the digital picture easel. The catalog view was bright and sharp, but it had been overcast when they were there, so he selected "overcast" from the ambient-light menu, and the picture took on a more subdued cast.

Next he brought in photo-mannequins of Nancy and himself from their own home photo album. He couldn't remember what he had been wearing, but he knew that Nancy had worn her khaki dress and "sensible" shoes for all the walking they would do that day. And, she was carrying that oversized leather handbag stuffed with maps and travel guides. Zeke would tease her about having her nose buried in the travel guides instead of experiencing it all firsthand and uninterpreted. So he collaged their photo-mannequins on the steps of the cathedral, with Nancy sitting on the steps, her face hidden behind the Michelin guide, and with him excitedly pointing skyward to the colossal nativity scene. He had to scale down the façade so that the scene was visible in the picture, which made him effectively 20 feet tall or so, but it was still quite a plausible picture.

The scene in the picture never took place, yet it held more of the experience that he had there than any of his actual photos. He saved the photo on a new optical disc he labeled "Spain," and also printed it out on the color printer to tack on the refrigerator so Nancy would see it when she came home. For a few minutes, he had been back to the steps of Sagrada Familia with her, and he wanted to share the souvenir.

Footnotes

1. Matthew White, "Is made-for-home video finally making it?", *Videography*, Volume 11, No. 5, May 1986.
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3. U.S. Bureau of the Census, *Statistical Abstract of the United States: 1986* (106th edition), Washington, D.C., 1985.
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5. Ivan Illich, *Tools for Conviviality*, New York: Harper and Row, p. 21, 1973.



Steve Gano

Steve Gano has been a designer and builder of interactive systems for 10 years. He received undergraduate degrees in psychology and computer science, and apprenticed in systems programming before joining MIT's Architecture Machine Group for graduate work. At MIT, Steve developed novel ways of interacting with images, created artificial talking heads with videodiscs, and produced electronic books with movies for illustrations. At the Atari Sunnyvale Research Lab, he developed prototypes of interactive systems for appropriating multimedia objects from large data bases for personal use. Now at Hewlett-Packard Laboratories, Steve is applying advanced computer graphics and video technologies to design new qualities of human-computer and interpersonal interactions.